# A Transect Approach To Mapping Tiger Beetle Colonies on the Brookhaven Firebreak

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### Abstract:

Tiger beetle (genus *Cicindela*) populations on the Brookhaven National Laboratory campus have been actively studied since their initial characterization in 2007. This project presents a transect approach to mapping the extent of tiger beetle populations on the fire breaks that run along the east and north of the campus. Visual index counts of adult members of the Cicindela punctulata and Cicindela sexautata populations on the firebreaks were performed and the numbers of individuals observed were used to gen-erate population density maps of the firebreaks It was observed that population densities for both species were highest at the periphery of both firebreaks. Implications of this pattern for anthropogenic disturbances in the compaction of soil along the firebreaks are discussed.

#### Introduction:

Tiger beetles represent are a widespread and well studied subfamily of insects. Over 2600 species have been described, distributed globally across a wide variety of habitats [1]. Because of their distribution and the preference of particular species for specific habitats. Tigel Beetles are widely used as indicator species in biodiversity studies and conservation planning [2].

Tiger beetle populations on the Brookhaven National Laboratory (BNL) campus have been actively studied since Jonathan Mawdsley's initial survey of possible habitats on the campus in 2007 [3]. The abundance of sandy soil on the grounds makes the site particularly suitable for studying populations of tiger beetle species, as many of the tiger beetle species that have been found in New York State have been found to demonstrate

strong preference for sandy, sparsely vegetated habitat [4]. Previous research has located populations of tiger beetle species at several locations on the BNL campus and has indicated that the species found on the BNL campus prefer habitat containing sediment in the size range of medium to coarse sand [3,5].

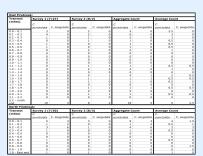
Populations of Tiger Beetle species on the firebreaks that run along the eastern and northern border of the campus are of particular interest to the Department of Environmental Resource Management. Aside fro containing the sandy, sparsely vegetated habitat favored by many species that have been found on the campus, the fire breaks are utilized by the lab as locations for the deposition of crushed concrete sediment [6]. The deposition of crushed concrete sediment alters the grain

size of the soil and changes soil compaction characteristics of the environment in such as way as to make it sub-optimal for those species of Tiger Beetle that prefer a more sandy soil.

While populations of Tiger Beetles have been documented on both the east and north firebreaks, no prior study has attempted to completely delineate the extent of those populations along either area. In constructing a comprehensive map of beetle locations at both fire breaks, it is hoped that the information gathered in this project will be useful in informing the continuing practice of depositing crushed concrete sediment so as to minimize the effect of such depositions on the tiger beetle populations of the firebreaks.

## Methodology:

- The number of adult beetles present along the firebreaks was determined using the standard visual index count method. [7]
  - Transect markers were established along the firebreak at intervals of every 0.1 miles.
    Researchers walked slowly between markers,
  - counting all adult Tiger Beetles that were
- Photographic documentation of representative individuals was obtained.
- GPS coordinates for every transect marker were
- Weather conditions were monitored every half hour.



ndex counts of tiger beetles encountered during transects of the east and breaks during this study. The highest densities of individuals was observed It the periphery of both firebreaks, with reduced densities occurring as

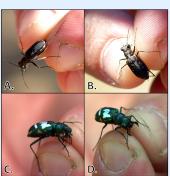


Fig. 1: Photographs of the two species of tiger beetle that were observed uring the course of this study: Cicindela punctulata (A., B.) and Cicindela punctulata (A., B.). ata (C., D.). C. punctulo segurator (C., D.). E. punctionar), the precommate species disserved unit this study is a summer species, while C. sexgurator is a spring species who have been observed to congregate in sunny areas as the mating season draws to a close. The number on the back of the C. sexgutata individual pictured was part of a concurrent study

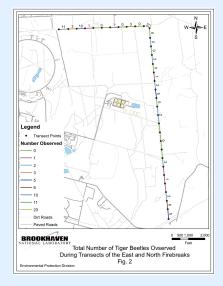




Fig. 3: Examples of areas of the firebreak where comparatively high densities of tiger beetles were observed. The southern end of the the east firebreak (A.), along with the western end of the north firebreak (not pictured) were found to have almost equal densities of tiger beetles, while picured) were found to have almost equal densities of tiger beetles, while the north east corner of both firebreaks (8.) had the highest density of tige beetles that was observed during the study.



Fig. 4: Examples of disturbances on the east firebreak that contribute to the destruction of tiger be 4c. Examples of distributions of the east neutral rate (communities to the destination) of age develor house. If may account for the reduced densities of tiger beetle populations observed in the middle of the firebreak, deposition of crushed concrete sediment (A.) changes the characteristic grain size of the soil. The scraping compacting action (B.) of heavy machinery (C.) makes it difficult for tiger beetles to dig burrows and destro hurrows, already reversal. Similar disturbances were renountered allows the north firebreak.

- ter, M.S., Knisley, C.B., & Reed, C.T. (2006). "Ha







# Discussion:

Previous studies of the Tiger Beetle populations at BNL have identified populations of five different species [3, 5]. In our project, we encountered and documented only two of the five previously identified species: *Cicindela* punctulata and Cicindela sexautata. This is not a particularly surprising finding, as our area of study was restricted to the east and north firebreaks and our survey was conducted from late July to early August. C. punctulata is widely distributed over much of North America. It is classified as a summer species, with most adults active from July through August [1]. C. sexgutata is spring species. As the mating season draws to a close, adults are typically found in sunny patches of sparsely vegetated ground near forested areas [1]. This fact does much to explain the occurrence of *C. sexgutata* in our

The populations of Tiger Beetles that inhabit the firebreaks are not uniformly distributed along either break. Counts for each species encountered were higher at the edges of the firebreaks than they were in the middle, with the highest density of individuals being found in the north-east corner shared by both firebreaks. These results suggest that there may be a negative correlation between the amount of disturbance in the area and the number of tiger beetles that inhabit the area. The north disturbed area that we surveyed. Aside from encountering areas of crushed concrete sediment along the firebreaks, we also encountered areas that seemed to be compacted by the activity of heavy machinery, most likely a bulldozer or backhoe. The north-east corner did not appear to be as effected by these disturbances as other areas of the firebreaks. Given the number of tiger beetles encountered in the north-east corner, efforts should be made to continue to leave the area relatively unaffected by human activity.

In considering future areas of research on the tiger beetle populations of the BNL firebreaks, there are several areas of interest that are suggested by this study. Research into seasonal distribution of tiger beetle species along the firebreak, and inventory of the number of species that inhabit the firebreak throughout the year are two areas of inquiry that would go far to expanding the research conducted for this study. Population mapping of other areas of the BNL campus are similarly useful. We have already located at least one other area of the campus that contain tiger beetles in densities similar to those found at the north-east corner of the firebreaks. Continued examination of the affect of human activity and disturbance on tiger beetle populations is another area of research that would inform the department of environmental protection in continuing to protect and preserve the populations of tiger beetles found at Brookhaven. We are likewise hopeful that the methodology employed in this study will prove to be useful for future population studies of tiger beetles that might take place on the Brookhaven campus

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